

# Basic Countermeasures to Make Intersections Safer

Collisions occur at intersections because motor vehicles are in conflict with each other when crossing or turning in traffic. Improving the engineering of intersections is the first step toward reducing accidents because vehicle conflicts—combined with flawed highway or street design and poor signage—often result in collisions of vehicles with roadside objects, pedestrians and other vehicles.

## Types of Collisions at Intersections

There are four major types of vehicle crashes at intersections.

**Crossing collisions** are when one vehicle strikes the side of another; these are the most severe type of crashes. They can result from vehicles attempting to drive straight through or turning within an intersection.

**Rear-end collisions** are common at intersections. They can be the result of poor street design or inadequate traffic engineering measures; but usually are the result of dangerous driver behavior, such as speeding, following too closely, and braking too late.

**Vehicles changing lanes improperly** or crossing a road's center line are less common at intersections than crossing and rear-end collisions.

**Pedestrian and bicycle collisions** occur most frequently in urban areas, particularly with older and younger age groups. In 2000, 34 percent of pedestrian deaths among people aged 65 and older, and 10 percent of pedestrian deaths among children age four and younger, occurred at intersections. Only two percent of motor vehicle-related deaths involved bicyclists, but 33 percent of these deaths occurred at intersections.<sup>1</sup>

Studies have shown that providing turn lanes for left-turning vehicles can reduce accidents by 32 percent. Signalization countermeasures include using 12 inch signal heads, providing separate signals over each lane, installing higher intensity signals and changing the length of signal cycles including the yellow change interval and the red clearance interval.

**Inadequate traffic engineering.** In some cases, traffic control devices—such as signs—are improperly used, placed in the wrong locations, too small to be seen, or have suffered damage or deterioration. In other instances, the growing number of cars on the road have outpaced what used to be acceptable traffic engineering measures.

**Driver licensing and education** often fails to train drivers to safely negotiate intersections. Some drivers do not know the basic traffic laws, they fail to understand what certain signs and pavement markings mean, or they do not respect the rights and safety needs of pedestrians.<sup>2</sup>

**Drivers disregard traffic control at intersections.**

Even knowledgeable drivers sometimes disregard the clear messages of traffic control devices—including stop signs, signals and pavement markings—and repeatedly violate traffic laws. Combined with speeding, disregard for traffic control at intersections is a major source of serious crashes. Driver distractions, such as cell phone use and inattention and drug and alcohol use, are additional human factors that

cause accidents with death and injuries.

## Countermeasures to Improve Intersection Safety

Safety problems must be identified by an engineering review. The most important thing to remember when improving safety at intersections is that countermeasures that improve vehicle traffic flow or reduce vehicle crashes should not compromise



## Intersection Crashes have Multiple Causes

**Poor physical design** of both the intersections and their approach roadways. A major aspect of safety design is restricted sight distances. With restricted sight distances, drivers do not have enough time to stop or avoid hitting a pedestrian or another vehicle.



pedestrian safety. There are three strategic decisions to consider when improving intersection safety design and operation:

- Eliminate vehicle and pedestrian conflicts when possible;
- When not possible, reduce unavoidable vehicle and pedestrian conflicts to lower the chances for collisions; and
- Design intersections so that when collisions do occur, they are not as severe.

Traffic engineering strategies to improve movement of vehicles and pedestrians are crucial to improving intersection safety. These consist of a wide range of devices and operational changes such as:

- **Addition of turn lanes at intersections.** Turn lanes are used to separate turning traffic from through traffic. Studies have shown that providing turn lanes for left-turning vehicles can reduce accidents by about 32 percent. Personal injury accidents involving left-turning vehicles can be decreased by as much as 50 percent. Separating right-turning vehicles from other vehicles can significantly affect operations at an intersection. By adding a separate right-turn lane at an intersection with a signal, the delay experienced by drivers on an approach can be reduced. At intersections without a signal, right-turn lanes can



safely remove turning vehicles that are slowing down in through traffic lanes. Turn lanes at major driveways can also improve safety, especially on high-volume or high-speed roadways.

- **Signals.** Increase the size of signal heads from 8 to 12 inches to increase their visibility; provide separate signals over each lane; install higher-intensity signal lenses; and change the length of signal cycles, including the yellow clearance interval and the all-red phases.
- **Non-traditional intersection design.** Consideration of non-traditional intersection designs such as roundabouts or traffic circles.
- **Pavement condition.** Upgrade pavement quality to better drain the road and resist skidding.
- **Improve drivers' sight distance.** Restrict parking near intersections and move stop lines back from intersections.
- **Upgrade and supplement signs.** Enforcing laws that prohibit dangerous intersection driving is a necessity to even well-designed and regulated intersections. Enforcement must be consistent because motorists who tend to violate traffic control are aware that the chances of receiving a citation are low. Sustained enforcement efforts have been proven to lower both intersection violations and crash rates, sometimes to a dramatic extent.

<sup>1</sup> FARS, 2002

<sup>2</sup> Federal Highway Administration, Stop Red Light Running Facts, May 2002